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CASTRATION FOR TUBERCULOSIS OF THE TESTICLE.[1]

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Not many years ago it was generally admitted that a radical operation for extensive tuberculosis of the testicle and epididymis was indicated when only the genital apparatus was affected by the disease, the remaining organs of the body being free. In the *Deutsche Chirurgie*, edited by Billroth and Luecke, will be found Kocher's classical article on the subject. In this he says that the reason for this procedure is the chance of a radical cure, although he admits the possibility of a spontaneous recovery, but which is, in most cases, accompanied by the functional loss of the organ involved. He also points out that a cure without operation is only a possibility, and if the organ with its disease is left intact, with the hope that the affection will finally disappear, the patient is exposed to all the dangers attendant upon suppuration. In other instances the condition demands a radical treatment. In a patient having tuberculosis of one testicle which is left untreated, it is always to be expected that within a short time its fellow will also become invaded by the process. This not only applies to the other testicle, but to the whole organism as well, and if the tuberculous testicle is not removed a metastasis of the process will take place in other parts of the body, usually in the form of a general miliary tuberculosis. From this it would appear that castration is absolutely indicated, and although the prostate and seminal vesicle were enlarged and other subjective symptoms of tuberculous infection of the genital organs were manifest, Kocher noted that these symptoms disappeared in a relatively short time after castration had been done. He even found that suppuration of the spermatic cord and abscesses of the prostate would oftentimes heal after incision if the diseased testicle were removed at the same time.

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König also confirms Kocher's views, and, in his opinion, infection of the prostate and urinary organs is no contraindication to castration, for the reason that the removal of the tuberculous testicle has a favorable action on the disease when located in other parts of the genito-urinary system, as well as upon the general condition of the patient. Southam, Simon, and others are also in accord on this point.

Various are the methods of performing castration, but in most instances, as there is only evidence of the disease involving the testicle and epididymis, the operation has usually been thought sufficient when the organ was simply removed. The technique employed simply consists in a longitudinal incision starting above the spermatic cord and extending down to the lower pole of the testicle. When one or more fistulæ exist, or if the skin should be adherent to the organ, the incision is carried round on both sides, so that an elliptical portion, including the fistulous openings in the scrotum, is removed along with the testicle. After peeling off the scrotal integument the spermatic cord is dissected out from its various coverings and then the arteries, veins, and vas deferens are ligated and the cord is cut through. The ligatures should be left long in order to keep the cut end of the cord from slipping up into the inguinal canal.

The testicle is then dissected out from above downward, and when it is adherent to the scrotal tissues this usually occurs in the neighborhood of its lower pole. When the organ has been removed all hemorrhage should be carefully controlled, the wound irrigated, and, after a final inspection of the stump of the cord, the threads are cut and it is allowed to slide up into the inguinal canal. A gauze wick should be inserted, the parts sutured, and the usual dressings applied.

Von Bungner has pointed out a fact which is well known, that the spermatic cord is often diseased without presenting much evident infection at the time of operation. From this arises the danger that the diseased parts which are left behind in the cord will act as disseminating foci for further tuberculous infection, and, in order to avoid this danger, he recommended a new method which he termed castration with evulsion of the spermatic cord. As in castration, the spermatic cord is separated from the vessels and its surrounding coverings, the vessels are tied off below the external inguinal ring, and then the isolated vas deferens is slowly but steadily pulled upon until it breaks. The piece of vas is removed along with the diseased testicle and epididymis. In his operations, von Bungner was able to extract about four-fifths of the spermatic cord by his method of evulsion, and, according to his statistics, he obtained a cure in 50 per cent. of his cases.

It is quite evident that removal of the vas deferens should be undertaken as far as possible in every case of castration, especially when it is evidently diseased, but the method of evulsion is certainly not devoid of danger. Lauenstein and Helferich pointed out the danger of hemorrhage occurring in the pelvic tissue from the traction exercised on the vessels accompanying the spermatic cord. The first-mentioned authority performed castration with evulsion of the vas in thirteen cases, and in several succeeded in removing quite large portions of the cord with much benefit to the patient, but in two instances such severe hemorrhage arose that it was extremely difficult to control it. Since this time Lauenstein only removes as much of the vas deferens as can be pulled down without exercising traction upon it.

A point which should not be forgotten is that in the method of evulsion the peritoneum can be easily torn, and with the raw surface of the cord the peritoneal cavity might easily become infected. Consequently, the method of evulsion is certainly not devoid of danger, and it also should be remembered that in all probability the diseased spermatic cord will rupture at a point where it is infected by the tuberculous process on account of lesser resistance. If this be true, and there is every apparent reason that it should be so, it would naturally scatter tuberculous material, which would be the starting point for a new dissemination of the disease. For these reasons Shede employs a technique similar to that described by Lauenstein, dissecting the spermatic cord up as high as possible and then ligating it at a point where it appears to be healthy, and, for this purpose, it may be necessary to dissect the peritoneum off the cord to a certain extent. It is evident that in this operation, as in others, the spermatic cord is not always removed beyond the point of disease, and, consequently, the affection still remains in the intra-abdominal portion of the vas which is left behind.

The length of the spermatic cord has been estimated as 32 cm. by König, who also resects the vas deferens under the control of the eye, and he has been able to remove as much as 25 cm.; von Bungner removed four-fifths of its entire length, which means practically about 25 cm., thus leaving from 7 cm. to 8 cm. of the cord, which in all probability was diseased.

Now, supposing the seminal vesicle or the prostate is affected by the disease, if it cannot be denied that the removal of the testicle has a favorable influence on the process, it must also be said that it certainly is insecure as regards the prognosis, especially when the tuberculous process within the organ is advanced, and, therefore, simple castration also must be considered insufficient. The involvement of the other genito-urinary organs in a case of tuberculosis of the testicle should always be admitted as more than probable, even when the spermatic cord appears so be perfectly intact; and von Bungner, in his paper, laid stress upon the fact that tuberculosis of the urogenital apparatus does not extend in continuity, and that occasionally the orifice of the vas deferens may be diseased, yet at its middle it may be healthy.

König has reported a case in which he found a spindle-shaped thickening at the external inguinal ring extending up the inguinal canal, which proved to be a tuberculous infection, although the spermatic cord seemed to be quite healthy. He points out the fact that the points of election for the development of the tuberculous process are where bends or curves take place in the canal.

The removal or direct local treatment of the infected seminal vesicles or prostate is most advisable, but these organs, unfortunately, are most difficult of access, and that to reach them is a most arduous undertaking is demonstrated by the numerous techniques that have been described.

The procedure described by Zuckerkandl is too severe to combine at the same time with castration, and resection of the vas deferens had better be done at a later date, when the patient has recovered from the operation of removal of the testicle.

The diseased parts are reached by the perineal route, a curved incision being made between the scrotum and anus. The posterior wall of the bladder is exposed and the prostate and seminal vesicles are reached after the connective tissue covering the latter has been opened. As numerous bloodvessels are to be found here, the hemorrhage must be controlled before proceeding, although this is very often a most difficult thing to do, on account of the depth of the parts in which one is working.

The question of hemorrhage has deterred many surgeons from selecting the perineal route, and even so great an authority as König advises against its use, suggesting another technique, which avoids this difficulty, using the sacral route, according to the method of Kraske, for resection of the rectum. The operation is preceded by several days' preparatory treatment of the patient, principally to thoroughly empty the intestine. The patient receives only liquid diet and the bowels are thoroughly emptied daily by castor oil and enemas.

The technique of the operation consists in making two longitudinal incisions, beginning on each side, 2 cm. from the median line at the highest point of the anterior border of the anus, the patient being in the lithotomy position, and carried downward midway between the anus and tuber ischii to the fourth or fifth sacral vertebra. After control of the hemorrhage, the incisions are deepened until the fascia pelvis parietales is reached. The space between the anus and tuber ischii is filled with cellular tissue, in which the inferior hemorrhoidal veins pass, supplying the external sphincter of the anus. There are, however, sufficient anastomoses present, so that there is no danger in cutting and ligating these vessels. The pelvic fascia being exposed, a third incision is made transversely over the sacrum down to the bone, which connects the two lower ends of the incision. The sacrum is then separated between the fourth and fifth vertebra, which is at about the level of the seminal vesicle.

In order to accomplish this a chain saw is passed through the fourth sacral foramen and the bone sawed through. At this point of the operation it should be remembered that severe hemorrhage may take place on account of section of the middle sacral artery and vein, consequently they should immediately be ligated before the operation is proceeded with.

A flap containing the soft parts and bone has now been formed and is then turned upward and the pelvic fascia is incised on the left side of the rectum, the gut being pushed over to the right. When this has been accomplished the structures to be reached are exposed and the posterior part of the bladder and prostate can be seen. On each side of the latter organ the vasa deferentia may be found, running downward to the point where the seminal vesicles are situated.

Each seminal vesicle is covered by a capsule of a fibromuscular nature, deprived almost completely of any blood supply on its posterior aspect, and, consequently, the capsule may be incised and the seminal vesicle peeled out without any danger of hemorrhage.

It is quite impossible to injure the bladder or the urethra at this point, and it is also fairly easy to remove the entire remaining part of the vas deferens up to the point where it enters the prostate. If thought necessary, the seminal vesicle on the other side may be removed, and should the prostate be found diseased the cheesy foci can be cleaned out with the curette. The parts are then plugged with iodoform gauze and the wound can be closed, only one long tampon being left protruding through the incision, which may be removed on the fourth day. The wound may also be left open for the purpose of local iodoform treatment, but a secondary suture does not give such brilliant results.

As to the after-treatment, it consists in confining the bowels for four or five days and the internal administration of tincture opii in sufficient quantity is indicated during this time, after which the bowels may be opened.

In a way this operation presents evident advantages, principally from the fact that the field of operation is easily reached and all the steps are under the control of the eye. The structures to be attained are not very deeply seated when this method is employed, severe hemorrhage is avoided, and the parts easily drained. The two methods just described are probably the best, but there are many others, principally those of Roux, Villeneuve, Guelliot, Rydygier, and others, that I should like to discuss were the limits of this paper sufficient to permit of it.

Unless the patient is in fairly good constitutional condition, such prolonged operation can hardly be advisable, and that this has also been so considered by other surgeons is well demonstrated from the fact that attempts have been made to treat the diseased parts by means of iodoform-glycerin injections. Von Bungner experimentally investigated upon the cadaver to what extent injections made directly into the lumen of the vas deferens might be pushed. He injected iodoform-glycerin into the lumen of the spermatic cord after section in both directions, and found that the entire genital tract from the epididymis to the urethral orifice was filled with the solution. Some of it ran out through the urethra. The seminal vesicles were filled, but contained a certain amount of the injected fluid. The liquid came in contact with those parts of the vas deferens which are usually involved in the tuberculous process, as well as the intracanalicular parts and the mucous membrane, both of which become involved during the progress of the process.

It was thought that by this method a cure might result without operation in those parts remaining after castration, but the iodoform treatment might also be employed without having done castration in cases where the tuberculous process is so far advanced that it cannot be eliminated, even by the removal of the entire urogenital tract. Under these circumstances this treatment will relieve the suffering in the later stages of the disease, and it also may be indicated in the very early stages of tuberculosis of the genital organs when a radical operation does not seem to be imminently necessary. It may also be employed where only a suspicion of tuberculosis exists.

Von Bungner's results are uncertain, because the method has only been employed for a short time, but it would appear to me that nevertheless a surgical operation should in the first place be undertaken, because the hopes of the instigator of the iodoform-injection method do not appear to me to be at all certain. Recently, however, a number of operators have appeared to give up the radical measures and adopted the milder ones, even going so far as to institute an expectant treatment. Some uphold that in most cases the epididymis is alone the seat of the disease, and that consequently destruction of the tuberculous foci seated within it is quite sufficient, and that castration is too radical, and should only be reserved for extreme cases. Senn claims good results by the sclerogenous method, but does not appear to be a strong advocate of its use.

Platon believes that the removal of one testicle in no way prevents the occurrence of the disease in the remaining organ, and should this arise it is hard to persuade a patient to lose his remaining seminal gland. Albert believes that he has also seen the disease appear in the remaining testicle and also the development of a general tuberculosis after castration has been done on one side, and for this reason he favors conservative treatment. Other authorities of late also oppose radical measures and deem that destruction of the diseased parts or ultimately an incision of the epididymis will be sufficient.

Among the conservative operations may be mentioned the experiments of Mauclaire, who endeavored to bring about atrophy of the testicle by ligation and section of the elements of the spermatic cord. It appeared to him that the best method was section of the entire spermatic cord, with the exception of the vas deferens and its accompanying vessels. Upon the appearance of the atrophic process, the tuberculous foci disappeared and a hard lump remained, which led the patient to believe that he still possessed his testicle.

It would appear to me, however, that the work done in this direction by Mauclaire has not been sufficiently controlled, and more recently there has been a tendency, not only to preserve the testicle itself, but also its functions as well, which, with the other methods described, were always lost.

Rasumowski, in an article which appeared in 1902, states that Bardenheuer tried to attain this end by endeavoring to give an exit to the semen by the formation of an anastomosis between the spermatic cord and the capsule of the testicle. To accomplish this the diseased epididymis was peeled out of its capsule and then the stump of the spermatic cord was sutured to the capsule, with the hope that the seminal fluid escaping from the rete testis would find its way into the space left by the excision of the epididymis and from there into the vas deferens, but this method naturally could never amount to anything. To form an anastomosis of any duration a simple mechanical union of the parts is not sufficient, for the reason that both mucosæ, covered with their epithelium, must be united in intimate relation to each other in the entire circumference of the anastomosis.

Rasumowski claims that he developed the same idea independently of Bardenheuer. He devised two methods of operation which would accomplish the same end; in one the indications for its use are when the entire epididymis has to be resected and a reunion of the vas deferens must be made with parts of the coni vasculosi. In the second operation the spermatic cord is united to the remainder of the epididymis when the tail and the part of the body of the latter have been removed. The technique of the first operation consists in resection of the epididymis, taking care that the vessels passing at the inner border of the epididymis to the testicle are carefully preserved. The cut end of the healthy part of the vas deferens is split up to the extent of about 1 cm., and, thus enlarged, it is stitched with fine catgut near to the rete testis, at a point where the epididymis was in close relation to the testicle. The sutures should only include the external connective tissue and muscular layers of the vas, while at the testicle the connective tissue of the corpus Highmorii is used. By this method the mucosa of both organs is supposed to be uninjured.

Now, in a certain sense, one is working in the substance of the testicle, and the connective tissue of the corpus Highmorii and that of the albuginea should be securely sutured in a manner similar to that employed for the fixation of the drainage-tube in the wall of the stomach in Witzel's method of gastrostomy. These sutures are then buried by pulling over the remainder of the covering of the testicle and suturing them. A small drain is inserted and the scrotum closed.

In the second method of anastomosis of the vas and epididymis the diseased parts are first resected, the end of the vas is split, and then a canal is formed in the cut surface of the epididymis; this canal should be about 1 cm. deep. Fine catgut sutures are inserted in the external layers of the stump of the spermatic cord, both ends of the sutures being threaded on needles. The stump is then introduced into the canal, the sutures are drawn through to the surface of the epididymis, and are tied in such a manner that the spermatic cord is fixed into the substance of the epididymis. By this method the borders of the mucous layer come into close apposition with the coils of the cut epididymis, and in order to bring about a more perfect apposition the borders of the transverse section of the epididymis can be brought together around the inserted vas. The wound is then closed with drainage.

Should the case require the resection of a large amount of the spermatic cord, so that its insertion within the epididymis would cause considerable tension, or should the testicle be pulled upward too much in order to obtain approximation, the body of the epididymis should be separated from the testicle and by turning it upward the parts can be approximated. Rasumowski states that in cases where a portion of the testicle has already been removed on account of tuberculous infection, the last-mentioned technique can be employed by making anastomosis with the tubuli contorti and recti.

That by such means anastomosis can in reality be established is proven by experimental work, and Skaduto was able to demonstrate microscopically that the sexual gland could by this means preserve its functional relations; but whether or not this histological demonstration would be the same in man, and whether or not sexual activity can be continued without impediment, Rasumowski does not say. This modern method has been as yet insufficiently experimented with for any conclusion to be made, and, although it is most ingenious, I do not believe that practically it will ever be of any real value.

In opposition to those who believe in simple resection of the diseased parts and who are opponents to the radical treatment, there are other surgeons who believe that an operation cannot be too radical, because other parts of the urogenital apparatus are first involved, while the testicle is invaded by the tuberculous process only secondarily, consequently being involved in a descending extension. For this reason removal of the entire testicle is insufficient.

The tuberculous process continues to spread and the immediate good effect of the operation sooner or later proves to be an illusion.

In Germany a descending extension of urogenital tuberculosis is admitted by a large number of surgeons, and so eminent an authority as König believes that the testicle becomes involved by descending tuberculous process seated in the prostate or bladder, and that a primary infection of the seminal gland, without the disease being present in any other part of the body, is an exception. It was Gussenbauer's opinion that the testicle was involved secondarily by a descending infection of the disease. These authorities considered castration of one testicle as absurd, and they look upon double castration as practically useless, for the reason that if the affection involves one gland the disease already exists in the prostate and seminal vesicle. In their opinion another factor should also be taken into consideration, which would be decidedly against the entire removal of the testicle, namely, the mental effect of the operation. It has been shown by a number of writers that the internal secretions of the testicle play an important part in metabolism. These recent discoveries in physiology have worked riot among a number of surgeons, but we would consider attentively the ideas emitted by von Bruns, because of their importance and also for the light they throw upon the subject. In Kocher's writings, already mentioned, the idea is expressed that partial resection means only accomplishing half the necessary work, and it is also stated that the seminal gland is more involved than can clinically be detected, and that consequently recurrences are practically certain. Von Bruns emits the same opinion, and gives statistics showing that in 40 per cent. of his cases, six months after anything was noticed, the testicle was diseased, as proven at the time of operation. If the duration was over six months, it was present in 60 per cent. of the cases. Now, taking into consideration that the process often proceeds without any evident clinical changes, it can readily be conceived how little partial excision of the parts apparently involved can help the patient in the majority of cases, and how seldom a durable success can be recorded unless the entire seminal gland is removed.

Still another argument speaks against limited excision of the testicle, namely, that in about 50 per cent. of all cases of tuberculosis of the organ the disease at a later period develops in the other gland, and, according to the statistics of von Bruns, 23 per cent. of cases in which castration was performed on one side developed the disease in the remaining testicle. From this it may be concluded that prevention of the development of the disease in the apparently healthy testicle is to be found in early castration of the one afflicted. It stands to reason that the partisans of partial resection are baffled, and their various methods of interference have no significance whatever. The opponents of radical treatment declare castration superfluous, while others uphold that the operation is most disadvantageous to the patient, because the primary focus is left behind in the body. Of course, it is here understood that, according to their views, tuberculosis of the testicle is due to a descending infection from the prostate and seminal vesicle, consequently a secondary process.

Baumgarten has thrown much light on this subject, for he has experimentally demonstrated on rabbits that tuberculosis of the bladder, in the pars prostatica urethræ, and in the prostate, could be produced by injecting cultures of very virulent tubercle bacilli, but he was never able to demonstrate tuberculosis of the spermatic cord or testicle. He observed the animals for a long period of time, and the process did not extend upward along the ureters. On the other hand, by experimentally infecting the testicle, he was able to demonstrate an ascending infection along the spermatic cord. In this case he injected the bacillus directly into the epididymis and the spermatic cord, and in order to avoid the objection that the virus might have attained the deeply seated part of the vas deferens he ligated it. It was also proven that none of the inoculation fluid entered the spermatic cord when injected into the epididymis, as no swelling of the cord near the epididymis could ever be found, and, microscopically, no tuberculous lesions could be demonstrated.

In all these experiments a rapid ascending extension of the process took place, but the testicle on the other side never became involved. Von Baumgarten rightly concludes, I believe, that the tuberculous process always follows either the current of secretions or the lymph, and never in an opposite direction. He believes that the explanation of this fact is to be found in the mode of living of the tubercle bacillus; this organism, being devoid of motion and being obliged to rely on passive transportation, must naturally follow the circulating currents. Beside this, they are unable to develop and grow in secretions, and for this reason they are powerless to resist the secretory currents unless retained by some obstruction.

Pathologically and clinically these experiments seem to be correct, and certainly coincide with facts, namely, that tuberculosis of the testicle often occurs when the other parts of the urogenital apparatus are intact. It would also go to show that descending infection by the bacillus of tuberculosis is impossible and that castration performed when the disease is still of short standing and not advanced will bring about a complete recovery, because it prevents the possibility of an ascending infection from taking place.

Von Bruns gives quite an imposing number of complete recoveries after castration of one testicle, namely, 46 per cent., and what makes it particularly valuable is that the observation of his cases continued over a period of thirty-four years.

If, however, one finds frequently other portions of the urogenital tract involved, it is only in very advanced stages of the process, especially where the prostate and bladder become infected secondarily from the testicle or by a descending infection from the kidneys. Only 12 per cent. died, according to von Bruns, from tuberculosis of the urogenital apparatus after castration had been performed on one side, and in almost all of the fatal cases the patient presented the picture of tuberculosis of the urinary apparatus before the operation was undertaken. The same may be said regarding the cases of double castration, of which 15 per cent. died from tuberculosis of the urogenital apparatus, but the majority recovered, thanks to the operation. The ultimate duration of cure in double-sided castration amounted to 56 per cent., and the time over which the cases were observed was thirty years.

The great number of recoveries in which unilateral castration was done would seem to refute the statement that an extension of the process from one testicle to another takes place.

Equally favorable results have been reported by Simon, who, during the space of twenty-two years, had operated on 107 cases of tuberculosis of the testicle; the lapse of time during which they were followed varied from ten to twenty years. Out of 92 cases, 59 were alive, 54 of whom were free from any evidence of tuberculosis. Of the 33 who died, 26 succumbed to the tubercle bacillus and 7 from an intercurrent disease. 61 cases had remained free from tuberculosis after the operation, which gives us 66.3 per cent. recoveries. Simon learned the ultimate outcome in 29 out of 34 cases in which bilateral castration had been done, with the astonishing result that only 8 of them had died.

Regarding the question of psychical changes occurring after bilateral castration, it would appear to me that they have been considerably exaggerated, and where mental disturbances occur they usually only amount to a decrease in sexual desire.

The conclusions that may be deduced from what has been put forward in this paper, as well as from some little personal experience, would be that radical treatment should not be allowed to become obsolete, that castration has an exceedingly low mortality, considered as an operation, and that if performed at an early period of the disease there is a good chance of preventing further infection from the bacillus of tuberculosis from taking place. Castration certainly complies with one of the most urgent demands of modern therapeutics, namely, the eradication of the soil breeding the disease, when, of course, the affection has not been present for too long a period and has not extended to other parts of the body. Conservative surgery applied to the testicle is practically useless when the organ is affected by tuberculosis, and it allows the dangerous consequences to arise which the radical treatment directly tends to avoid.